

# **BROADCAST SYSTEM AND METHOD FOR BROWSING THE WEB**

## **FIELD OF THE INVENTION**

The present invention relates to a broadcast system and more particularly to a method for browsing the Web using the broadcast system.

## **BACKGROUND OF THE INVENTION**

The presently available digital broadcast includes a communications satellite (CS) broadcast, cable broadcast, Internet broadcast, and the like. These digital broadcasts are received by a set-top box (STB), for example. An STB, which is connected to a television, has a function of receiving and converting video signals and an interface for connecting a telephone line and a personal computer.

FIG. 5 is a schematic diagram of a transmitting unit 10 and a receiving terminal 20 for digital broadcast. The transmitting unit 10 transmits multiplex data (MPEG2-TS), in which video and audio data, computer program, EPG (electronic program guide) data are combined, to the receiving terminal 20. The transmitting unit 10 includes a video server 14 for compressing video and audio data and an application server 12, or a general purpose computer. The receiving terminal 20 includes an STB 22 for receiving a digital data broadcast and a television 24 having a visual output unit and audio output unit. The STB 22 may be built into the television 24.

As shown in FIG. 6(a), the video server 14 comprises MPEG 2 (Motion Picture Expert Group phase 2) encoders 30 which compress video and audio data 1, 2, 3, and 4 including audio data (audio 1, 2, 3, and 4) and video data (video 1, 2, 3, 4) in accordance with the MPEG2 standard;

1 a multiplexer 32 which multiplexes the compressed video and audio data 1, 2, 3  
2 and 4, EPG and the like;

3 and a transmitter 34 for transmitting the multiplexed data (MPEG2-TS). FIG. 6(b)  
4 shows an overview of the data (MPEG2-TS) transmitted by the transmitting unit 10. In  
5 FIG. 6(b), a plurality of MPEG 2 data are included in the same frequency band in a  
6 time-division manner.

7 As shown in FIG. 7, the STB 22 comprises a receiver 40 for receiving the data  
8 (MPEG2-TS) transmitted from the transmitting unit 10;

9 a demultiplexer 42 for separating the multiplexed data (MPEG2-TS);

10 an MPEG2 decoder 44 for decoding the video and audio data compressed in the  
11 MPEG2 standard;

12 a video decoder 46 for converting the decoded video data into a video signal for  
13 television display;

14 an input device 52 for operating the STB 22;

15 a communication device 48 for communicating the transmitting unit 10 via  
16 communication lines such as telephone lines;

17 and a microprocessor unit (MPU) 50 for controlling these devices included in the  
18 STB 22.

19 In the case of CS broadcasting, the receiver 40 receives digital broadcast using a  
20 parabolic antenna. The received data (MPEG 2-TS), which is the multiplexed data, is

1 separated into video and audio data by the demultiplexer 42. The video and audio data are  
2 transmitted to the MPEG2 decoder 44, and the EPG data is transmitted to the MPU 50.  
3 The video and audio data are decoded in the decoder 44. The volume of the decoded audio  
4 data is adjusted in an amplifier (not shown), and then sent to a speaker integrated in the  
5 television 24, for example. The decoded video data is converted into video signals for  
6 television display, and then sent to the television 24.

7 The EPG data transmitted to the MPU 50 is stored in a memory (not shown). The  
8 input device 52 is used for selecting a program to watch, changing the display of the EPG,  
9 and so on. For example, when an operation button of the input device 52 is pushed, the  
10 MPU receives the information that the button has been pushed. For example, when a  
11 program to watch is selected, the MPU 50 changes the MPEG2 data transmitted from the  
12 demultiplexer 42 to the MPEG2 encoder 44 to the program data selected in the above step.  
13 For example, when display control of the EPG data is performed in the input device 52,  
14 the MPU 50 transmits the EPG data to the video encoder 46. In the encoder 46, the EPG  
15 data is converted into video signals for television display, and then it is displayed on the  
16 screen of the television 24. The MPU 50 transmits watched program information to the  
17 transmitting unit 10 via the communication device 48. The application server 12 receives  
18 the watched program information and then calculates a viewing fee on the basis of the  
19 watched program information.

20 In these days, STBs having the function of not only receiving digital broadcast, but  
21 also browsing the Web on the Internet are becoming increasingly common. FIG. 8 is an  
22 overview of the connection between the Internet 16 and a receiving terminal 20 and a  
23 transmitting unit 10 in a digital broadcast system. Web data is transmitted from the  
24 Internet 16 to the receiving terminal 20 via the transmitting unit 10. The term "web data"  
25 used herein includes web page data such as HTML (Hyper Text Markup Language) file,  
26 image file, audio file and the like. The image file includes still picture and motion picture.

27 FIG. 9 (a) shows an example of a web page 60. The web page 60 includes a picture  
28 62, characters 64, and links 70, 72, and 74. The links 70, 72, and 74 are linked to other

1 web pages. As shown in FIG. 9(b), links are provided to diagonally shaded areas 82, 84,  
2 and 86. Selecting one of the links 70, 72, and 74 by clicking on it, the user can browse a  
3 web page linked to the selected link.

4 As shown in FIG. 10(a), the web data transmitted from the Internet 16 to the  
5 application server 12 is sent to the multiplexer 32 in the video server 14. The web data,  
6 EPG data, MPEG2 data, and the like are then multiplexed and sent to the STB 22. An  
7 example of the transmitted data (MPEG2-TS) included in the same frequency band in a  
8 time-division manner is shown in FIG. 10(b).

9 As shown in FIG. 11, the STB 22 receives the web data (MPEG2-TS) transmitted  
10 from the transmitting unit 10. The received data is separated in the demultiplexer 42, and  
11 then transmitted to the MPU 50. The MPU 50 activates a web browser (a software for  
12 browsing the Web), and transmits graphic output of a web page to the television 24 via the  
13 video encoder 46. An image 80 shown in FIG. 12(a), which is displayed by the web  
14 browser, is converted into video signals, and then sent to the television 24. The volume of  
15 audio data is adjusted in an amplifier (not shown), and then sent to the television 24.

16 The input device 52 can be used for selecting one of the links by positioning a  
17 cursor 76 shown in FIG. 12(b) in the link and clicking a mouse button, for example. The  
18 function of selecting a link using a cursor is provided to the web browser, and the selection  
19 of a link is executed by the MPU 50. The MPU 50 sends selected link information to the  
20 transmitting unit 10 via the communication device 48. The application server 12 receives  
21 the selected link information from the receiving terminal 20, and requests the Internet 16  
22 to transfer a web page linked to this link. When the requested web page is transferred from  
23 the Internet 16 to the application server 12, the server 12 sends the web page to the  
24 receiving terminal 20 in the same manner as described above.

25 As stated above, it is possible to browse the Web using an STB. However, as  
26 compared to the case where digital broadcast is received, a higher-speed MPU and a  
27 larger-capacity memory must be used when the web browser is used. In addition, since  
28 there is little compatibility between the MPUs and between the operating systems (OS)

1 used in various STBs, the web browsers may often vary among the STBs. Even if the  
2 same web browsers are used in the STBs, functions may vary among STBs due to the  
3 addition of function enhancement software such as plug-in software. Thus, the variations  
4 between the web browsers may cause a failure of displaying a web page on the screen.

## 5 SUMMARY OF THE INVENTION

6 It is therefore an aspect of the present invention to provide methods, apparatus and  
7 systems for browsing the Web without using a web browser. In an example embodiment a  
8 digital broadcast system of the present invention includes (a) a transmitting unit  
9 comprising means for converting a web page from the Internet into video data and  
10 providing a link to the video data on the basis of a link provided to the web page;

11 means for compressing the video data in accordance with a predetermined  
12 compression scheme;

13 and means for transmitting the compressed video data and information about the  
14 link;

15 and (b) a receiving unit comprising means for sending the received data to a video  
16 display device;

17 and means for establishing an association between the link provided to the video  
18 data and a position of a cursor in the video data transmitted to the video display device.

19 Another aspect of the present invention is to provide a method for browsing the  
20 Web using the digital broadcast system including the steps of:

21 converting a web page transmitted to the transmitting unit from the Internet into  
22 video data;

1 compressing the video data in accordance with a predetermined compression  
2 scheme;

3 transmitting the compressed video data;

4 and receiving and decoding the transmitted video data using the receiving unit to  
5 transmit the data to the video display device.

6 In some cases the step of compressing video data comprises:

7 converting a web page transmitted to the transmitting unit from the Internet into  
8 video data and transmitting the data;

9 compressing the video data in accordance with the predetermined compression  
10 scheme;

11 providing a link to the video data on the basis of a link provided to the web page,  
12 and transmitting the compressed video data and information about the link.

13 In some cases the step of receiving and encoding the transmitted video data  
14 comprises:

15 decoding the received data;

16 transmitting the decoded data to the video display device;

17 and establishing an association between the information about the link provided to  
18 the received video data and a position of a cursor in the video data transmitted to the video  
19 display device.

1 In the broadcasting system according to the present invention, a web page is  
2 converted into video image data in the transmitting unit, and compressed in the MPEG2  
3 encoder to transmit to the receiving terminal. In the receiving terminal, the MPEG2  
4 decoder decodes the video data. Since the MPEG2 decoder is used for displaying the web  
5 page, there is no need to use a web browser, so that neither a conventional high-speed  
6 MPU nor a high-capacity memory is necessary.

7 In the method for browsing the Web in the digital broadcasting system according  
8 to the present invention, video data into which a web page is converted is compressed in  
9 accordance with the MPEG 2 standard and then transmitted. The compressed data can be  
10 decoded by the MPEG2 decoder. Since the MPEG2 decoder is used for displaying the web  
11 page, there is no need to use a web browser, so that neither a conventional high-speed  
12 MPU nor a high-capacity memory is necessary.

### 13 BRIEF DESCRIPTION OF THE DRAWINGS

14 These and other aspects, features, and advantages of the present invention will  
15 become apparent upon further consideration of the following detailed description of the  
16 invention when read in conjunction with the drawing figures, in which:

17 FIG. 1 is a block diagram showing an example of a broadcast system including a  
18 transmitting unit and a receiving terminal connected to the Internet according to the  
19 present invention;

20 FIG. 2(a) is a block diagram showing an example of a video server included in the  
21 transmitting unit shown in FIG. 1(a);

22 FIG. 2(b) shows an example of an MPEG2-TS shown in FIG. 2(a);

1 FIG. 3(a) shows an example of link information;

2 FIG. 3(b) shows another example of a link area;

3 FIG. 3(c) shows an association between a cursor position and a link area in an  
4 MPU included in an STB;

5 FIG. 4 is a block diagram showing an example of the STB included in the  
6 receiving terminal shown in FIG 1;

7 FIG. 5 is a block diagram showing a transmission of a digital broadcast from the  
8 transmitting unit to the receiving terminal;

9 FIG. 6 (a) is a block diagram showing an example of a video server in the  
10 transmitting unit shown in FIG. 5;

11 and FIG. 6(b) shows an example of an MPEG-TS shown in FIG. 6(a);

12 FIG. 7 is a block diagram showing an example of an STB of the receiving terminal  
13 shown in FIG. 5;

14 FIG. 8 is a block diagram showing an overview of a receiving terminal connected  
15 to the Internet via the transmitting unit;

16 FIG. 9(a) shows an example of a web page;

17 FIG. 9(b) shows link areas established in the web page shown in FIG. 9(a);



FIG. 10(a) is a block diagram of a conventional video server in the transmitting unit shown in FIG. 8;

FIG. 10(b) is an example of an MPEG2-TS shown in FIG. 10(a).

FIG. 11 is a block diagram of a conventional STB in the receiving terminal shown in FIG. 8;

FIG. 12(a) shows an example of an image transmitted from an MPU (Microprocessor unit) of an STB, and

FIG. 12(b) shows an example of video output transmitted from an STB.

## DESCRIPTION OF THE INVENTION

The present invention provides methods, apparatus and systems for browsing the Web without using a web browser. In an example embodiment a digital broadcast system of the present invention includes (a) a transmitting unit comprising means for converting a web page from the Internet into video data and providing a link to the video data on the basis of a link provided to the web page; means for compressing the video data in accordance with a predetermined compression scheme; and means for transmitting the compressed video data and information about the link, and (b) a receiving unit comprising means for sending the received data to a video display device; and means for establishing an association between the link provided to the video data and a position of a cursor in the video data transmitted to the video display device.

The present invention also provides a method for browsing the Web using the digital broadcast system including the steps of: converting a web page transmitted to the transmitting unit from the Internet into video data; compressing the video data in

1 accordance with a predetermined compression scheme; transmitting the compressed video  
2 data; and receiving and decoding the transmitted video data using the receiving unit to  
3 transmit the data to the video display device.

4 In some cases the step of compressing video data comprises: converting a web  
5 page transmitted to the transmitting unit from the Internet into video data and transmitting  
6 the data; compressing the video data in accordance with the predetermined compression  
7 scheme; providing a link to the video data on the basis of a link provided to the web page,  
8 and transmitting the compressed video data and information about the link.

9 In some cases the step of receiving and encoding the transmitted video data  
10 comprises: decoding the received data; transmitting the decoded data to the video display  
11 device; and establishing an association between the information about the link provided to  
12 the received video data and a position of a cursor in the video data transmitted to the video  
13 display device.

14 In the broadcasting system according to the present invention, a web page is  
15 converted into video image data in the transmitting unit, and compressed in the MPEG2  
16 encoder to transmit to the receiving terminal. In the receiving terminal, the MPEG2  
17 decoder decodes the video data. Since the MPEG2 decoder is used for displaying the web  
18 page, there is no need to use a web browser, so that neither a conventional high-speed  
19 MPU nor a high-capacity memory is necessary.

20 In the method for browsing the Web in the digital broadcasting system according  
21 to the present invention, video data into which a web page is converted is compressed in  
22 accordance with the MPEG 2 standard and then transmitted. The compressed data can be  
23 decoded by the MPEG2 decoder. Since the MPEG2 decoder is used for displaying the web  
24 page, there is no need to use a web browser, so that neither a conventional high-speed  
25 MPU nor a high-capacity memory is necessary.

26 In the following embodiments, a transmitting unit 10 and a receiving terminal 20  
27 included in the broadcast system of the present invention is may be the same as the  
28 conventional ones (shown in FIG. 8), as shown in FIG. 1. An application server 12 in the

1 transmitting unit 10 shown in FIG. 1 converts a web page 60 shown in FIG. 9(a)  
2 transmitted from the Internet 16 into video data of an image 80 shown in FIG. 12(a) and  
3 sends the video data. Then, the server 12 provides links to the image 80 on the basis of the  
4 links 70, 72, and 74 provided to the web page 60.

5 Specifically, a web browser is activated on the application server 12, and, as shown  
6 in FIG. 2(a), the video data of the image 80 is sent to an MPEG2 encoder 0 of a video  
7 server 14 as in the case of a video data being sent to a display screen, and then compressed  
8 in the same manner that conventional video and audio data 1, 2, 3, and 4 is compressed.  
9 When links are set at hatched areas 82, 84, and 86 of the web page 60 shown in FIG. 9(b),  
10 contour coordinate data of the areas 82, 84, and 86 are extracted by the application server  
11 12 as shown in FIG. 3(a).

12 A link area is often rectangular or simple geometric in shape. Especially, a link  
13 area provided to a word or phrase is rectangular in shape. When a link area is rectangular  
14 in shape, the link area can be described using coordinates of the four vertexes of the area.  
15 When a link area is shaped like an arrow, coordinate data of seven vertexes of the area are  
16 extracted. When a link area is of a complex shape such as oval, a rectangular area 84  
17 circumscribing the area, shown in FIG. 3(b), may be considered as a link area. Most of  
18 link areas are defined in an HTML file, so that coordinate data can be extracted from the  
19 HTML file.

20 The link areas 82, 84, and 86 are linked to other web pages and the like. While  
21 extracting coordinate data concerning the above-described areas 82, 84, and 86, the  
22 application server 12 generates link information including addresses of web pages linked  
23 to the areas 82, 84, and 86. Thus, link information containing coordinate data of all the  
24 link areas within a web page and addresses of web pages linked to these areas are  
25 generated. The link information is generated on the basis of coordinate data contained in  
26 the HTML file, and sent to a multiplexer 32 of the video server 14.

27 A receiving terminal 20 shown in FIG. 1 according to the present invention outputs  
28 the video data of the image 80 to a television 24. An MPU 50 of an STB 22 shown in FIG.

1 4 establishes an association between the link information of the video data of the image 80  
2 and a position of a cursor 76 in the video data of the image 80. Specifically, the terminal  
3 20 compares a position coordinate of the cursor 76 with coordinates of points included in  
4 the areas 82, 84, and 86.

5 For example, as shown in FIG. 3(c), it is determined whether or not a coordinate  
6  $P(X,Y)$  of the cursor 76 is positioned in the area 82, 84, or 86. When the MPU 50  
7 determines that the coordinate  $P(X,Y)$  of the cursor 76 is positioned in the area 82, 84, or  
8 86, the MPU 50 inform the user about that by changing the appearance of the cursor 76 or  
9 the like. In much the same fashion as a conventional web browser, a desired link can be  
10 selected by moving the cursor 76 using the input device 52.

11 Next, an example method for browsing the Web using such digital broadcast  
12 system will be described. The web page 60 is transferred from the Internet 16 to the  
13 application server 12, and the application server 12 sends the video output data (80) of the  
14 web page 60 to the video server 14. Where the web page 60 also includes voice data, the  
15 application server 12 also sends the audio output data to the video server 14. Audio and  
16 video data are received by the MPEG2 encoder 0 of the video server 14. In the same  
17 manner that video data (Video 1, 2, 3, and 4) and audio data (Audio 1, 2, 3, and 4) are  
18 compressed, the MPEG2 encoder 0 compresses audio and video data of the image 80 in  
19 accordance with the MPEG 2 standard.

20 When the application server 12 sends the video data of the image 80, the  
21 application server 12 extracts link areas 82, 84, and 86 on the basis of the links 70, 72, and  
22 74 provided to the web page 60, and generates link information including web addresses  
23 linked to the links 70, 72, 74 provided to the web page 60 and data defining the link areas  
24 82, 84, and 86 on the image 80.

25 The link information and the video data of the image 80 compressed in accordance  
26 with the MPEG 2 standard are combined with other MPEG 2 data, EPG, and the like in the  
27 multiplexer 32, and then transmitted from the transmitter 34. An example of the  
28 transmitted data (MPEG 2-TS) is shown in FIG. 2(b). The web page 60 is compressed in

1 accordance with the MPEG2 standard after being converted into the video data of the  
2 image 80. Therefore, it takes up less file space and can be transferred at higher speed than  
3 a conventional web data (HTML file, image file, voice file) shown in FIG. 10(a).

4 As in the case of conventional data, the data MPEG2-TS shown in FIG. 2(b) is  
5 received by a receiver 40 in the STB 22, and transmitted to a demultiplexer 42. As shown  
6 in FIG. 4, while sending video data and audio data of the image 80 to the MPEG2 decoder  
7 44, the demultiplexer 42 sends link information to the MPU 50. The video data 80 and  
8 audio data decoded by the MPEG2 decoder 44 is outputted to the television 24 in the same  
9 manner as conventional. The image 80 shown in FIG. 12(a) is displayed on a television  
10 screen 24. As shown in FIG. 12(b), the cursor 76 which can be manipulated by the input  
11 device 52 in the same manner as conventional is also displayed on the television screen  
12 76.

13 Since the web page 60 is compressed in accordance with the MPEG2 standard after  
14 being converted into the video image data in the transmitting unit 10, it can be reproduced  
15 by decompressing it by the MPEG2 decoder 44. The decoder 44 is used for displaying web  
16 data, so that there is no need to use a web browser. For this reason, neither a conventional  
17 high-speed MPU nor a high-capacity memory is necessary. Thus, the web can be browsed  
18 without causing any compatibility problems between MPUs, between OSs and between  
19 browser softwares.

20 The selection of a link on a web page can be made in the same manner as  
21 conventional by comparing a coordinate of the cursor 76 with a coordinate of the area 82,  
22 84, or 86 using the MPU 50. When the user selects a link by moving the cursor 76 using  
23 the input device 52, information of the selected link is sent to the transmitting unit 10 via  
24 the communication device 48. The application server 12 of the transmitting unit 10 makes  
25 a request to the Internet 16 for transferring a web page linked to the selected link. The web  
26 page transferred to the application server 12 is transmitted from the transmitting unit 10 to  
27 the receiving terminal 20.

1 While an embodiment of the present invention has thus been described, the present  
2 invention can be realized in other embodiments. For example, the present invention is not  
3 limited to browsing the Web using a digital broadcast system, but it can be used for  
4 browsing the Web using an analog broadcast system. The wave page may include only  
5 voice or sound, or it may include only picture. The present invention is not limited to  
6 browsing the Web, but it can be used for browsing electronic mails. Also the compressing  
7 technique is not limited to the MPEG2 standard, but any compression scheme can be  
8 employed in the present invention. The broadcast system of the present invention is not  
9 limited to television broadcasting, but it covers two-way communication systems for  
10 transmitting and receiving video and/or audio data in a music or movie distribution. The  
11 present invention is not limited to wireless communication such as satellite broadcasting,  
12 but it can be employed in a cable transmission such as cable broadcasting. Also, a web  
13 page can be displayed on a full screen or on a part of a screen. In addition, the present  
14 invention can be used in a television conference system, in which an HTML file is used as  
15 a shared conference material .

16 While the embodiments of the present invention have thus been described with  
17 reference to the drawings, it should be understood that the present invention be not limited  
18 to the embodiments shown in the drawings. Various changes, modifications, and  
19 improvements can be made to the embodiments on the basis of knowledge of those skilled  
20 in the art without departing from the scope of the invention.

21 The present invention can be realized in hardware, software, or a combination of  
22 hardware and software. A visualization tool according to the present invention can be  
23 realized in a centralized fashion in one computer system, or in a distributed fashion where  
24 different elements are spread across several interconnected computer systems. Any kind of  
25 computer system - or other apparatus adapted for carrying out the methods and/or  
26 functions described herein - is suitable. A typical combination of hardware and software  
27 could be a general purpose computer system with a computer program that, when being  
28 loaded and executed, controls the computer system such that it carries out the methods

1 described herein. The present invention can also be embedded in a computer program  
2 product, which comprises all the features enabling the implementation of the methods  
3 described herein, and which - when loaded in a computer system - is able to carry out  
4 these methods.

5 Computer program means or computer program in the present context include any  
6 expression, in any language, code or notation, of a set of instructions intended to cause a  
7 system having an information processing capability to perform a particular function either  
8 directly or after either or both of the following conversion to another language, code or  
9 notation, and/or reproduction in a different material form.

10 Thus the invention includes an article of manufacture comprising a computer  
11 usable medium having computer readable program code means embodied therein for  
12 causing a function described above. The computer readable program code means in the  
13 article of manufacture comprising computer readable program code means for causing a  
14 computer to effect the steps of a method of this invention. Similarly, the present invention  
15 may be implemented as a computer program product comprising a computer usable  
16 medium having computer readable program code means embodied therein for causing a  
17 function described above. The computer readable program code means in the computer  
18 program product comprising computer readable program code means for causing a  
19 computer to effect one or more functions of this invention. Furthermore, the present  
20 invention may be implemented as a program storage device readable by machine, tangibly  
21 embodying a program of instructions executable by the machine to perform method steps  
22 for causing one or more functions of this invention.

23 It is noted that the foregoing has outlined some of the more pertinent objects and  
24 embodiments of the present invention. This invention may be used for many applications.  
25 Thus, although the description is made for particular arrangements and methods, the intent  
26 and concept of the invention is suitable and applicable to other arrangements and  
27 applications. It will be clear to those skilled in the art that modifications to the disclosed  
28 embodiments can be effected without departing from the spirit and scope of the invention.

1 The described embodiments ought to be construed to be merely illustrative of some of the  
2 more prominent features and applications of the invention. Other beneficial results can be  
3 realized by applying the disclosed invention in a different manner or modifying the  
4 invention in ways known to those familiar with the art.

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